Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Mathematical Models For Eulerian Conditional Statistics in a Complex Turbulent Flow JAMES HILL, Iowa State University (Retired), EMMANUEL HITIMANA, MICHAEL OLSEN, RODNEY FOX, Iowa State University — Honoring Ted O'Brien. Conditional moment closure (CMC) methods were developed for predicting turbulent reacting flows. However, conditional averages appear as unclosed terms that need to be modeled. In the present work the linear approximation and PDF gradient models were used to predict the conditional mean velocity and mixture fraction and compare with experimental data obtained for a macroscale multi-inlet vortex chemical reactor (macro-MIVR) using laser diagnostic techniques. The results for velocity conditioned on mixture fraction show that the linear model works well in a low turbulence region away from the reactor center. The PDF model with an isotropic turbulent diffusivity performs poorly for the tangential and axial conditional velocities, but a modified version that considers three components of turbulent diffusivity is better. Furthermore, the mixture fraction conditioned on the velocity vector components has a more linear behavior near the reactor center, where the probability density function (PDF) of the mixture fraction is close to a Gaussian distribution.

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Date submitted: 31 Jul 2019 Electronic form version 1.4